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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
LEYKIN, RITA	
ART UNIT	**PAPER NUMBER**
2837	

DATE MAILED: 06/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/943,961	LEQUESNE ET AL.	
	Examiner	Art Unit	
	Rita Leykin	2837	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *3/23/05*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *28-54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *28-54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

This office action is in response to arguments filed on 3/23/05. Applicant's arguments have been considered, but found not persuasive. During the examining process the broadest interpretation was given to the language of submitted claims. The prior art documents not only in the field of switched reluctance motor starting process, but also pointed to the alignment of the rotor and stator poles that involves claimed limitations such as sequentially energizing one of the phases and bringing the rotor to a holding position. The rotation of the rotor to a holding position, that includes one of the phases that is detected and another phase that is a second to the detected phase is a known part of alignment procedure during switched reluctance motor start-up. Cranking the rotor is interpreted as sending an initial command, in other word, an actuation command that is always lasting some predetermined time. The prior art document by Jung US# 6,411,060 teaches detection of the position of the rotor with reduced number of position sensors. Wherein at an initial stage of the starting of switched reluctance motor, microprocessor sequentially outputs a plurality of control signals thereby aligning the rotor, please see column 3, lines 52-66. During the aligning operation the microprocessor outputs the first control signal. The first control signal is applied to the lower switching transistor of the driving unit and thus the lower switching transistor and the upper switching transistor are turned on for a predetermined time. The rectified dc voltage is applied to the A phase winding La of the rotor thereby rotating the rotor by a predetermined angle. The next sequential step is to apply dc voltage to the B phase

winding Lb of the rotor, thereby rotating the rotor by a predetermined angle. As a result, the rotor is moved to the position where the position detection unit can detect the rotor position. The order phase energizing must be determined by considering a rotational direction during the normal rotation of the rotor after the starting of the switched reluctance motor, (see column 4, lines 1-65). That reads on applicant's "cranking the rotor in a direction as dictated by the actuation command for a predetermined time period".

Lajsner et al. US # 6,448,736 disclose control of switched reluctance motor that includes aligning of the rotor with the second phase. Wherein,

> FIG. 1 conveniently illustrates the alignment and non-alignment between rotor and phases. The rotor is in alignment with a phase (or "aligned"), when energizing the phase does not contribute to any torque, or rotation of the rotor (minimum reluctance position); accordingly, when the rotor is not in alignment with the phase (or "non-aligned"), energizing the phase moves the rotor in either direction.

That corresponds to minimum torque value that will require reduced ampere level, as in claims 36, 45 and 54. Also according to disclosure torque value in switched reluctance motor is a function of design and can be retrieved from a look-up table of a processor. Value of current is corresponding to torque value, hence minimized torque will call for reduced current. The reduction of current value during start-up, minimizes heat losses, as in claims 30, 31, 39, 40, 48 and 49.

Lajsner et al. teach energizing the first phase at a first time point and monitoring an increase of the phase current in the first phase during first time period until the phase current reaches maximum. And monitoring a decrease of the first current until at a second time point the phase current reaches a minimum and starts to increase again. In the next step Lajsner et al. is de-energizing the first phase at a third time point that follows the second time point at a predetermined time interval. In Lajsner et al. the aligning step performed by energizing the second phase, (see abstract and col. 3, lines 21-67).

In combination above teachings read on applicant's "rotating the rotor to the holding position upon expiration of the predetermined time period" and "exciting a second phase of the motor and first phase of the motor in a sequential manner and thereby to rotate the rotor pole to the initial position, the second phase being adjacent the first phase", as in claims 28, 29, 32, 34, 35, 37, 38, 41, 43, 44, 46, 47, 50, 52, 53.

With respect to claims 33, 42, 51, the alignment technique of four phase reluctance motors based on detection of one phase, is known and can be seen in various prior art documents provided herein.

Based on the above examiner maintains the rejection of previous office action as follows.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 28, 29, 32-35, 37, 38, 41-44, 46, 47, 50-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jung US # 6,411,060 and Lajsner et al. US # 6,448,736.

With respect to claims 28, 29, 35, 37, 38, 46, 47, 53 Jung discloses driving device for a Switched Reluctance (SR) Motor, wherein at an initial stage of starting of switched reluctance motor, microprocessor sequentially outputs a plurality of control signals, thereby aligning the rotor. Wherein, the plurality of transistors are at an ON state for a sufficient time according to the control signals, so that the rotor can be pulled to a silent pole of the stator, in other words holding position. And wherein, the microprocessor sequentially outputs the control signals in consideration of the rotational direction of the rotor after starting the SR motor, (see abstract and column 7, lines 30-48).

With respect to claims 32-34, 41-44, 50-52, Jung does not teach excitement sequence of third phase of the motor.

However, Jung teaches a microprocessor for sequentially outputting a plurality of control signals at an initial stage of the starting of the SR motor and sequentially outputting plurality of control signals according to the detected position after starting SR motor, wherein the plurality of transistor switches of the driving circuit is being switched by the plurality of control signal.

Jung teaches that operational control of the motor during starting is performed without the detecting of a phase position of the rotor.

Lajsner et al. disclose a switched reluctance motor with a first phase and a second phase that is comprising aligning the rotor with the second phase, at a first time point (t1), energizing the first phase 1, monitoring an increase of the phase current (I1) in the first phase (1) until the phase current will reach the maximum (302), monitoring a decrease (303) of the first phase current (I1) until at the second time point (t2) the phase current (I1) reaches a minimum (304) and starts to increase again (305); de-energizing the first phase (1) at a third time point (t3) that follows the second time point (t2) at a predetermined time interval and repeating energizing, monitoring and de-energizing for the second phase (2) instead of the first phase (1). Hence, Lajsner et al. disclose method for controlling the switched reluctance motor based on phase current data, without use of position detector.

Hence, it has been obvious to one of ordinary skills in the art, at the time invention was made to use teachings of Lajsner et al. on sensorless SR motor control,

based on current detecting, and apply this teaching to Jung disclosure of operational Switched Reluctance motor control to drive the motor in a predetermined sequence that is synchronized with the angular position of the rotor relative to the stator.

The reason is to achieve knowledge of relative position of rotor to the stator for the operational controller for instance during a "start-up" operation.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 30, 31, 36, 39, 40, 45, 48-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jung US # 6,411,060, and Lajsner et al. US # 6,448,736, and McCann US # 6,075,332.

The limitations of the independent claims have been discussed in the paragraph above.

Jung and Lajsner et al. do not teach minimizing current or heating losses. Jung and Lajsner et al. also do not teach means for determining motor torque. Even though, the torque data for switched reluctance motor based on design of the motor can be stored and retrieved from processor memory. In addition, McCann teach that higher motor current results in lower operational efficiency and greater thermal heating.

Modifying the conduction angles and providing the adequate minimum amount of required time response can achieve the greater motor efficiency. Wherein, the optimum conduction angles can be determined by using a predictive signal processing techniques to estimate motor torque that will be commanded. McCann discloses a predictive conductive angle motor control system for the brake-by-wire application. Wherein, McCann introduces predictive techniques, to estimate the value of the motor torque request, (see column 1, lines 62-67 and column 2, lines 1-18 and column 6, lines 47-65).

Hence, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine teachings of Jung and Lajsner et al. and McCann to provide a controlling current losses device in Switched Reluctance motors, by reducing period of application of the phase current according to the predicted torque.

The reason is to minimize current and heating losses in the motor phase.

Conclusion

3. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rita Leykin whose telephone number is (571)272-2066. The examiner can normally be reached on Monday-Friday 8:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Martin can be reached on (571)272-2107. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Rita Leykin
Primary Examiner
Art Unit 2837

R.L.

Rita Leykin